

## CROP DIVERSIFICATION IN DINDIGUL DISTRICT – A TEMPORAL ANALYSIS

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### ABSTRACT

*Dindigul has a semi and tropical monsoon type, which is suitable for various crops. During the past decade, the area under paddy and irrigated groundnut has been reduced by -82.18% and -83.8%, respectively. Based on the area growth rates of important crops in these blocks, it is evident that, the crops having the major shares like paddy and groundnut have grown negatively and the crops like pulses, maize, fruits, coconut, vegetables have grown positively over the years. Diversification index value clearly indicates that, the crop diversification has taken place over the years in these blocks. The extent level of area under paddy will decline from 1607.28 ha (2015-16) to 713.30 ha (2020-21), and also the extensive level of area under groundnut will decline from 269.49 ha (2015-16) to 126.28 ha (2020-21).*

**KEYWORDS:** paddy and irrigated groundnut, pulses, maize, fruits, coconut & vegetables

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## INTRODUCTION

Dindigul has a semi and tropical monsoon type, which is suitable for various crops. It is one among the leading district in the production of crops like Maize, Guava and Vegetables. With the limited gross area sown, the higher productivity of many crops has been achieved by practicing intensive farming. But, the district has witnessed deceleration from 2000's onwards, since the growth in agriculture faced major constraints, such as growing water scarcity, urbanization, land degradation, declining farm sizes, and rise in cost of labor and transition from traditional crops to commercial crops. During the past decade, the area under paddy and irrigated groundnut has been reduced by -82.18% and -83.8%, respectively, and the area being compensated by coconut, mango, black gram and banana.

## METHODOLOGY

### Herfindahl Index

Herfindahl index is used in the study, to measure diversification. Herfindahl index is the sum of the squares of the acreage proportion of each crop in the total cropped area. That is,

$$HI = \sum_{i=1}^{i=N} P_i^2$$

Where,  $p_i$  is the share of each crop defined as,

$$P_i = A_i / \sum_{i=1}^n A_i$$

Here,  $A_i$  is the acreage area under each crop;  $\sum_{i=1}^n A_i$  is total acreage area and the value of H ranges from

0 to 1. While, unity implies complete specialization, zero implies high diversification. Hence, as Herfindahl index Increases, diversification in a particular region increases and as HI decreases, diversification in that region increases.

### Simpson Index

Simpson Index of Diversity (SID) is used to capture the extent of diversification in the study area. SID is calculated using the formulae

$$SID = 1 - \sum P_i^2$$

Where  $I = 1, 2, \dots, n$ . And  $P_i$  is the proportional value (or area) of the  $i^{th}$  crop in the total value (area) of output. When SID is close to one it implies that the diversification increases and when the SID is close to zero, there is no diversification.

### Compound Growth Rate

The exponential function of the following form was used to estimate the growth rate (Gujarati, 1992). It is defined as

$$Y_{it} = A_i (1 + r_i)^t \quad (1)$$

Where,

$Y_{it}$  – Area of  $i$  crop at time  $t$  (ha)  $r$  – Compound growth rate of  $Y_i$

$A_i$  – Initial year area of  $i$  crop  $t$  – Time in years

By taking natural logarithm of (1),

$$\ln Y_{it} = \ln A_i + t \ln (1 + r_i) \quad (2)$$

Now letting

$$a_i = \ln A_i \quad \beta_i = \ln (1 + r_i)$$

Equation (2) can be written as

$$\ln Y_{it} = a_i + \beta_i t \quad (3)$$

Adding the disturbance term to (3), it can be written as

$$\ln Y_{it} = a_i + \beta_i t + U_t$$

Where,  $a$  – Constant term  $\beta$  – Regression co-efficient

This log linear function was fitted by using an ordinary least square method. The compound growth rate ( $r$ ) was obtained using the formulae.

$$r_i = (\text{Antilog } \beta_i - 1) \times 100$$

## FINDINGS AND DISCUSSIONS

### Changes in Share of Important Crops

The changes in share of important crops are presented in Table 1

**Table 1: Share of Important Crops**

S. No.	Crops	Percentage Share of Important Crops Area			
		Palani		Vadamadurai	
		2005-06	2014-15	2005-06	2014-15
1.	Paddy	20.45	7.04	23.87	2.02
2.	Maize	32.31	22.77	2.00	13.27
3.	Pulses	12.32	16.04	19.11	29.64
4.	Sugarcane	10.98	7.21	0.50	0.46
5.	Fruits	9.05	15.59	4.48	11.50
6.	Vegetables	1.15	1.67	7.25	6.45
7.	Cotton	0.24	0.84	2.18	0.24
8.	Groundnut	1.32	0.45	26.82	4.37
9.	Gingerly	0.41	0.90	0.15	0.05
10.	Coconut	11.77	27.49	13.64	32.00

From the table 1, Concerning Palani block, Maize has the highest share of 32.31 per cent in gross cropped area followed by paddy (20.45 per cent), pulses (12.32 per cent), coconut (11.77 per cent), sugarcane (10.98 per cent), and fruits (9.05). Similarly the other crops contributed only least share i.e., groundnut, vegetables, gingerly and cotton with 1.32 per cent, 1.15 per cent, 0.41 per cent and 0.24 per cent respectively during 2005-06. The share of the crops like paddy, maize, sugarcane, and groundnut has decreased over the years (2005-15). The highest share decreased crop in this block is paddy from 20.45 per cent in 2005-06 to 7.04 per cent in 2014-15.

However, the share of pulses increased from 12.32 per cent to 16.04 percent, fruits from 9.05 to 15.59 percent, vegetables from 1.15 to 1.67 percent, cotton from 0.24 to 0.84 per cent, gingerly from 0.41 to 0.90 percent and coconut from 11.77 percent to 27.49 percent. The increase in the number of coir industry, brick kiln, tender coconut sale nearby temple and bypass might have encouraged them, to expand the area under coconut cultivation in this block. Introduction of farmer interest group and farmer, producer company concept might have led them, to diversify their cropping pattern. The Ayakudi Fruits and Guava Producer Company started in the study area might be the contributing factor, for increasing area under fruit cultivation over the period of time.

It is clear from the above discussion and field observation that, share of major crops like paddy, maize, sugarcane, and groundnut has decreased over the years in this block. However, the share of other crops like pulses (i.e., black gram, green gram and cow pea) fruits (i.e., mango, supported, and guava), vegetables (i.e., Moringa, tomato, brinjal, and bhendi), and coconut has increased over the years. This shows that, Palani block is moving towards crop diversification rather than specialization.

As regards vadamadurai block, groundnut has the highest share of 26.82 percent in gross cropped area, followed by paddy (23.87 percent), pulses (19.11 percent), coconut (13.64 percent), vegetables (7.25 percent), fruits (4.48 percent), cotton (2.18 percent) and maize (2.00 percent). The other crops contributed only least share i.e., sugar cane (0.50 percent) and gingerly (0.15 percent) during 2005-06.

The share of the crops like paddy, sugarcane, vegetables, cotton, groundnut and gingerly had decreased over the years (2005-15). The highest share decreased crop in this block is groundnut from 26.82 percent in 2005-06, to 4.37 percent in 2014-15.

However, the share of maize increased from 2.00 percent to 13.27 percent, pulses from 19.11 percent to 29.64 percent, fruits from 4.48 to 11.50 percent, and coconut from 13.64 percent to 32.00 percent. The reasons could be the

increase in demand of maize for animal feed, maize value added products and availability of maize farmers' interest group on this block. The increase in number of coir industry, coir pith composting enterprise, coconut value addition, units, and oil mills would be the reasons for the increase in area, under coconut cultivation.

It is clear from the above discussion and field observation that, share of major crops like paddy, sugarcane, vegetables, cotton, groundnut and gingerly had decreased over the years in this block. However, the share of other crops like maize, pulses (i.e., black gram, green gram and cow pea), fruits (i.e., mango, sappotta, and guava) and coconut has increased over the years. This shows that, Vadamadurai block is moving towards crop diversification, rather than specialization.

## GROWTH RATE OF THE AREA OF IMPORTANT CROPS

Compound Growth Rate of Important Crops is worked out and the results presented in Table 2.

**Table 2: Compound Growth Rate of Important Crops**

S. No	Crop	Palani		Vadamadurai	
		CGR (%)	Sign	CGR (%)	Sign
1.	Paddy	-12.803	-	10.96	+
2.	Pulses	1.01	+	0.80	+
3.	Fruits	2.84	+	7.25	+
4.	Vegetables/Groundnut	6.08	+	-17.22	-
5.	Coconut	4.92	+	6.82	+

It is observed from the above table that, the annual area growth rate of all crops except paddy has grown positively on Palani block. Paddy had decreased 12.803 percent, over one decade. It might be due to the reason that, the farmers in this study area (Palani block), have shifted their farm from paddy cultivation to other crop cultivation. It is understood that, during the past one decade, the area under paddy had reduced year by year, and it has been compensated by vegetable crops (tomato, brinjal, bhendi and moringa), pulses (black gram, green gram, and cowpea), fruits (sappotta, mango, and guava) and coconut.

But, in Vadamadurai block, the annual area growth rate of all crops except groundnut has grown positively in this block. Groundnut had decreased 17.22 percent, over the one decade. It might be due to the reason that, the farmers in this study area (Vadamadurai block) have shifted from groundnut crop to other crops. From the past one decade observation, the area under groundnut had reduced year by year, and it has been compensated by maize, pulses (black gram, green gram, and cowpea), fruits (sappotta, mango, and guava) and coconut.

Based on the area growth rates of important crops in these blocks, it is evident that, the crops having the major shares like paddy and groundnut have grown negatively, and the crops like pulses, maize, fruits, coconut, vegetables have grown positively, over the years. This gives a further clear picture of crop diversification, in these blocks.

## DIVERSIFICATION INDEX

The secondary data for the period from 2005-06 to 2014-15 of important crops area are used to calculate HI & SID, and the results are presented in table 3.

Table 3: Diversification Index

S. No	Period	Palani		Vadamadurai	
		Herfindahl Index	Simpson Index	Herfindahl Index	Simpson Index
1.	2005-06	0.1958	0.8042	0.1922	0.8078
2.	2006-07	0.2085	0.7915	0.1699	0.8301
3.	2007-08	0.2060	0.7940	0.1557	0.8464
4.	2008-09	0.2163	0.7837	0.1536	0.8502
5.	2009-10	0.2111	0.7889	0.1498	0.8397
6.	2010-11	0.2042	0.7958	0.1602	0.8375
7.	2011-12	0.2076	0.7924	0.1625	0.8386
8.	2012-13	0.1701	0.8289	0.1614	0.8387
9.	2013-14	0.1723	0.8277	0.2158	0.7842
10.	2014-15	0.1880	0.8120	0.2213	0.7787

With the respect of Palani block, the Herfindahl index value ranges between 0.1701 and 0.2163. This value clearly indicates that, the crop diversification has taken place over the years in this block. This might be due to the reduction of cultivable area, over the period of time, which was converted to apartments, hotels, schools and plastic company. Similar to Herfindahl index, the Simpson index also evidently proved crops diversification in the study area.

It was known from the secondary sources that, during 2005- 06, the farmers practiced only crop cultivation as a main occupation. As days and years go by, they are taking up different enterprises, simultaneously i.e., Cropping + animal husbandry, cropping + non- farm activity, animal husbandry + non- farm activity, Cropping + animal husbandry+ non- farm activity, integrated farming system. Increased family expenditure pattern, unfavorable weather condition, shortage of skilled labor and avoiding farming, by the next generation and urbanization could be the favorable reasons for diversification. And also the availability of a nearby procurement centre like cooperative milk society, Aavin, Hatsun, value addition, units like milk processing centre, oil mills, and coir industry, coir pith composting unit, coconut handicrafts making units, and coconut value addition units would have attracted the farmers for doing animal husbandry and coconut cultivation. The non – availability of labor and diversify in farming, has pushed some of the farmers into non-farm sectors, to establish brick kiln and coir industry in their own farm.

Farming experience, innovativeness and their exposure to different information sources pull the farmers, to practice new farm business. The establishment of the Farmer Producer Company of the group of farmers in the study area, is the motivating factor for farmers for taking up fruit cultivation as a voluntary act.

Similarly, in Vadamadurai block, the Herfindahl index value ranges between 0.1498 and 0.2213. This value clearly indicates that, the crop diversification has taken place over the years in this block. This might be due to the fact that, at present farmers are cultivating sorghum and *Desmanthusvirgatus* (velimasal) as fodder crops for animals. Similar to Herfindahl index, the Simpson index also evidently proved crops diversification in the study area.

## EXTENT OF DIVERSIFICATION OF IMPORTANT CROPS

Extent of diversification of important crops is predicted from the fitted growth model paddy and groundnut over the past one decade as below.

Table 4: Extent of Diversification

S. No	Year	Palani (Paddy) Area (in ha.)	Vadamadurai (Groundnut) Area (in ha.)
1.	2015-16	1607.28	269.49

Table 4: Contd.,			
2.	2016-17	1367.77	231.58
3.	2017-18	1163.95	199.00
4.	2018-19	990.50	171.01
5.	2019-20	842.90	146.95
6.	2020- 21	717.30	126.28

The table 4 reveals that the extent level of area under paddy will decline from 1607.28 ha (2015-16) to 713.30 ha (2020-21).

From the table, the extent level of area under groundnut will decline from 269.49 ha (2015-16) to 126.28 ha (2020-21).

## CONCLUSIONS

Crops having the major shares like paddy and groundnut have grown negatively, and the crops like pulses, maize, fruits, coconut, vegetables grown positively over the years. This shows that, the state is moving towards crop diversification, rather than specialization. The crop diversification index value has reduced over the years. Hence, it is concluded from the study that, crop diversification has been taking place in this district over the years.

## REFERENCES

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